DOES FOOD INSECURITY PREDICT DEPRESSION AMONG BRAZOS VALLEY RESIDENTS?

A Dissertation

by

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ABSTRACT

Given that rural America faces challenges with access to mental health services and consistent access to healthy food, information is needed examining the relationship between these variables. The current study investigated whether food insecurity contributed significantly to the prediction of depression independent of other relevant factors such as participation in a supplemental nutrition assistance program, age, gender, race, and income in a sample of individuals residing within a predominantly rural region. The primary hypothesis was that food insecurity would be positively correlated with higher depression scores. Supplemental nutrition assistance program participation was a secondary variable of interest. Participants were 2,499 individuals living in seven rural counties who completed mailed questionnaires containing over 80 questions regarding numerous health domains and demographic information.

Hierarchical regression indicated that even after controlling for important demographic variables, food insecurity was predictive of higher depression scores as measured by the PHQ-9. Individuals participating in the WIC assistance program endorsed higher levels of depression, however, there was a minimal relationship between food stamp use and depression symptoms. Gender was significantly associated with higher endorsement of depression symptoms and food insecurity, with women more likely to report symptoms than men. There was also a limited positive relationship between race and endorsing depression symptoms. In this sample, rural respondents did not differ significantly from their metropolitan counterparts regarding depression. Differences may be better accounted for by sample characteristics that moderate effects

of these major predictors. Given the unique challenges that rural residents face daily and the harmful consequences of these issues, future research in this area is needed.

DEDICATION

I dedicate this work to my loving mother, Rebecca Soto Guerra, for always seeing in me things that I could not, for believing things would work out every time regardless of the circumstance, and for consistently allowing me the space to get there in my own time.

I dedicate this work to my father, Eden Guerra, for instilling in me a curiosity for new things, a work ethic and drive that got me through the challenging times, and for helping me to understand that sometimes the road less traveled leads to unexpected joy.

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TABLE OF CONTENTS

LIST OF TABLES

I. INTRODUCTION TO THE STUDY

Rural and urban areas differ in numerous ways, including variations in size, population, economics, environment, demography, social structure, and rural/urban culture (Eberhardt et al., 2001). It is well-documented that individuals living in rural areas experience various hardships differing from their urban counterparts including reduced access to health and mental health care, and limitations in acquiring necessary goods and services. Restricted access to services has specific consequences in rural populations including overall lowered quality of general care, less access to specialty care, and poor utilization of services due to lack of knowledge of service availability. Due to lack of resources, rural populations are at a higher risk for adverse health outcomes and decreased functional status, making individuals living in rural areas a vulnerable population (Leight, 2003).

Mental health, specifically depression, has also become a public health concern in rural communities. Mental health was among the top leading health indicators investigated by Healthy People 2010, a program launched by the United States Department of Health and Human Services (DHHS). This program sets national goals for health and disease prevention (Centers for Disease Control and Prevention [CDC], 2011). Depression has been known to lead to loss of job productivity, comorbid illness, and loss of life (Greden, 2001).The World Health Organization determined depression specifically to be among the foremost causes of disability worldwide ("New Study Presents," 2008), and people living in rural areas may be hit the hardest with mental health issues (Gustafson, Preston, & Hudson, 2009).

Rural America and Food Insecurity

Disparities in access to food choice in rural areas can lead to food insecurity which is a significant nutrition-related public health concern in the United States (Gundersen, Kreider, & Pepper, 2011) and the unique context of rural areas may influence specific pathways that contribute to the consequences of food insecurity. A variety of sources have defined household food insecurity which often has significant implications of overall health, and is frequently linked to poverty and low levels of income (Ivers & Cullen, 2011).

Hampl and Hall (2002) state that food insecurity "…involves anxiety about running out of food or running out of money to purchase more food" (p. 919). In 2006, changes were made to the United States Department of Agriculture's (USDA) definition of food security, dividing households into two groups; those with low food security had been "food insecure without hunger" and were now *Low Food Secure*, and those with very low food security had been "food insecure with hunger" and were now *Very Low Food Secure* (Coleman-Jensen & Nord, 2012). These changes ensured that the biological state of hunger did not convolute the household characteristic of food availability. Nord, Andrews, and Carlson (2009), as part of the Economic Research Service of the USDA, defined food insecurity as a period of time during the previous year in which "the food intake of one or more household members was reduced and their eating patterns were disrupted because the household lacked money and other resources for food" (p. 4).

Individuals living in rural areas also experience hardships regarding food choice based on their location of residence. A consequence of their rural residence status is

higher consumption of calorie dense foods as a result of lacking nutritious food options, or high cost of nutritious food. Reduced access to goods and services and lowered levels of care leads to overall reduced quality of life (Goins & Mitchell, 1999). This limited access in food choice can contribute to food insecurity.

Various health and mental health outcomes have been associated with food insecurity including increased risky sexual behavior, poor coping skills, anxiety, and obesity; effects in these relationships is debatable, however. Research on the effects of food insecurity in locations that lack resources is also scarce (Ivers & Cullen, 2011). The purpose of this study was to investigate the predictive relationship between household food insecurity and depression, and what effects supplemental nutrition assistance program participation may have along with other variables, such as gender and race.

Supplemental Nutrition Assistance Defined

About 25% of all Americans partake of at least one supplemental food service program at some point during a given year (United States Department of Agriculture, 2012d). This study included participants that received benefits from the Supplemental Nutrition Assistance Program (SNAP), previously known as the Food Stamp Program and the Women, Infants, and Children Program. SNAP helps provide financial support so that individuals can obtain food (United States Department of Agriculture, 2012b). SNAP is the country's largest food assistance program for low-income individuals and served just over 44 million people monthly on average in 2011 (United States Department of Agriculture, 2012b; Tiehen, Jolliffe & Gunderson, 2012). The WIC program provides participants with financial benefits to purchase food options that will

supplement their diets along with information on healthy eating (United States Department of Agriculture, 2012g). In 2010, the WIC program had over 9 million participating individuals (United States Department of Agriculture, 2011).

Rural residents in particular struggle with using their nutrition assistance benefits and finding nutritious food options. Food insecurity outcomes, as impacted by supplemental nutrition assistance, can also be inconsistent. Furthermore, increased awareness is needed regarding participation in nutrition assistance programs and how this impacts or is impacted by mental health, specifically depression. Studies have shown a bidirectional relationship between depression and food insecurity, and there is limited literature as to the relationship between receiving supplemental nutrition assistance and mental health. There is also a dearth of literature linking all three variables.

Purpose of the Study

The purpose of this research was to address gaps in the literature regarding how household food insecurity relates to depression and what effects this may have in nutrition assistance program participation. Specifically, this study explored and helped to understand specific factors possibly associated with self-reported depression in a sample of members residing in a rural community. Given that access to mental health services and consistent access to nutritious food is a concern in rural America, documentation is needed exemplifying the relationship between these variables. This research will add to our knowledge of the associations between food insecurity and self-reported depression in a predominantly rural region. This information, in turn, will aid in the development of

programmatic research and intervention programs to address the needs of the population. The gaps in the literature are discussed in the following study in order to demonstrate the importance of this topic.

II. DEPRESSION, FOOD INSECURITY, AND SUPPLEMENTAL NUTRITION ASSISTANCE: A REVIEW OF THE LITERATURE

In this section, rural status, depression, household food insecurity, and supplemental nutrition assistance are explored. Sections outlined include relevant definitions of the constructs investigated as well as literature describing how each variable potentially impacts or is impacted by other variables in the study. This review concludes with an explanation of the rationale for this study and the hypothesis directing data analysis.

Defining Rural Populations

Rural locations are primarily thought of as isolated areas containing pockets of people living far apart or large spaces with no access to amenities such as restaurants or shopping malls. There are both subjective and objective definitions of 'rural' and currently there is no one single definition. Several federal agencies have defined rural status in the United States (Reynnells, 2012). Having numerous definitions reflects the multidimensional nature of rural America and how making distinctions between urban and rural is difficult (Cromartie & Bucholtz, 2008).

The most applicable definition for "rural", according to Cromartie and Bucholtz (2008), is one that is guided by the aim of the research effort underway. The three most commonly used definitions of rural locations come from the Department of Commerce's Bureau of the Census, the Office of Management and Budget (OMB), and the Department of Agriculture's Economic Research Service (ERS) (Reynnells, 2012). In 2010, the Census Bureau did away with the previously designated 'central place' which

had certain population size criteria (United States Census Bureau, n.d.). Currently, the Bureau of the Census uses population density to define urban areas and urban clusters. Accordingly, urbanized areas (UA) must have densely developed land that has a population of 50,000 or more and urbanized clusters (UC) must be densely developed and have at least 2,500 people but less than 50,000 (United States Census Bureau, n.d.). Consequently, all individuals living in urbanized areas and areas that have populations of 2,500 or more surrounding UAs are defined as urban. Because the Bureau of the Census uses exclusionary criteria to define rural, all areas situated outside the UAs and UCs that do not meet criteria for being urban are considered rural (Reynnells, 2008). The Office of Management and Budget uses Metropolitan or Micropolitan distinctions. Metropolitan areas have a core urban area of at least 50,000 people whereas a Micropolitan area contains a core urban area containing between 10,000 and 50,000 individuals. All counties that do not meet criteria for being Metropolitan or Micropolitan are considered rural (United States Department of Health and Human Services, n.d., para. 1-3).

The Economic Research Service (ERS), within the USDA, maintains the chief source of economic data and research, and defines rural with an entirely different system. These other methods of categorization are the Urban Influence Codes (UICs) and the Rural-Urban Continuum Codes (RUCCs). The RUCCs help differentiate metropolitan counties by dimension and non-metropolitan counties by how urbanized they are or their closeness to a metropolitan location (Parker, 2012). The codes further subdivide the OMB metropolitan and non-metropolitan groups into nine categories.

Codes zero to three are defined as metropolitan and four to nine as non-metropolitan (Parker, 2012). For the purpose of this study, the dichotomous Census Bureau codes were used to allow for simplification of defining this particular rural population since they allow for a dichotomization between urban and rural. These categories were also assigned at the county level.

Characteristics of Rural Populations

Approximately 19.3% of the total United States population, or about 59,500,000 people, live in rural areas (United States Census Bureau, 2012). Rural areas are unique from urban areas and as such the populations living in each of these locations have unique daily living situations. There are within-community variations and between-community variations that makes each rural location unique.

Some rural differences are associated with the community itself, and other differences are inherent to rural communities as a whole (Monk, 2007). Essential attributes include small community size, limited numbers of residents, restricted choice in schools, services, other amenities, and distance between population concentrations (Monk, 2007). Characteristics closely related to those essential to rural community status include higher rates of poverty, larger aging populations, and job loss (Albrecht, Albrecht, & Albrecht, 2000; Monk, 2007). Other more positive attributes include the beauty and tranquility of rural locations (Monk, 2007). Rural residence, however, has also been linked to health and mental health inequalities. This study primarily focused on rural mental health disparities.

Rural Communities and Disparities

The multidimensional word “disparity” describes an inherently ambiguous concept that is measured by varying degrees. The National Institutes of Health (NIH) developed a working group in the year 1999 that not only established the definition of "health disparities" but was also tasked with finding ways to eradicate health disparities in the United States. For the purpose of this study, the NIH definition of health disparities was used:

“Health disparities are differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions that exist among specific population groups in the United States.” (National Institutes of Minority Health and Health Disparities, 2010)

Individuals living in rural areas, and specifically minority groups, continually experience discernible disparities in health and health care access. McLeroy, Bibeau, Steckler, and Glanz (1988) proposed from a social-ecological perspective that disparities in rural communities result from an ongoing and systemic array of institutional, policy, and community-based influences that limit individual options and choices. Rural populations endure higher premature death rates, infant death rates, and higher age-adjusted death rate than their urban counterparts (Eberhardt et al., 2001). Rural residents are also more likely to endorse having overall poor health, being overweight, and limitations in daily activities (Patterson, Moore, Probst, & Shinogle, 2004).

Access to appropriate health care is a noteworthy concern as well. Almost two-thirds of United States rural areas are designated health professional shortage areas

(HPSAs) (United States Department of Health and Human Services, 2012). Counties having African Americans or Hispanics as the majority group are also likelier to be considered an HPSA (Alegria et al., 2002).

Rural Mental Health Disparities

Individuals living in rural areas have been shown to have a higher risk for mental and behavioral health problems; especially older adults and the chronically ill (National Advisory Committee on Rural Health and Human Services [NACRHHS], 2004). Although there is some research to suggest that there is no significant difference in the occurrence of major depressive disorder in rural and urban populations (Kessler et al., 2003), the discussion has now turned to what brings about a demonstrated difference in the two populations. Current literature indicates that the difference between these groups is not based on geography; location of either being in a rural or urban area, but instead based on socio-demographic characteristics of the residents themselves.

Depression

Depression has significant implications not only in the mental health arena but also in other societal domains. The Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition-Text Revision (*DSM-IV-TR*) further classifies Major Depressive Disorder as having one or more Major Depressive Episodes and at least two weeks of a depressed mood or loss of interest with at least four additional symptoms of depression (i.e. significant weight loss without dieting or weight gain, insomnia or hypersomnia, psychomotor agitation or retardation nearly every day, fatigue or loss of energy nearly every day, feelings of worthlessness or excessive or inappropriate guilt

nearly every day, recurrent thoughts of death and /or suicidal ideation) (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000).

In 1996, 2.6% of all male deaths, of the 2.3 million deaths that year, were credited to unipolar major depression. For females, unipolar major depression was credited with being the second leading cause of disability adjusted life years (McKenna, Michaud, Murray, & Marks, 2005). In 2010, the CDC examined the Behavioral Risk Factor Surveillance System (BRFSS) data; assessments given at the state level in all 50 states (CDC, 2010b). The BRFSS, created by the CDC, is a database consisting of information collected monthly regarding health behaviors and practices, and health care access. Data from 2006 and 2008 was used to determine the rates of major depression and "other depression" in the two weeks prior to completion of the questionnaire. Findings indicated that the number of people coping with some form of depression at that time occurred in rates between 4.8% and 15% nationwide. In Texas, the prevalence of depression ranged from 8.4% to 9.1% (CDC, 2010a). The examination also found that the individuals with the tendency to be the most depressed were women, people between 45-64 years old, individuals of color, Blacks, Hispanics, non-Hispanic persons of other races or multiple races specifically, and those who had not graduated high school.

Depression as a Public Health Concern

The current literature reveals that depression is a major public health concern. Depressed individuals often present substantial rates of comorbidity with chronic disease and psychological, behavioral, and/or physical symptoms which may include irritability, indecisiveness, low self-esteem, substance abuse, violent behaviors, insomnia or

hypersomnia, fatigue, weight loss or gain, and headaches (Cassano & Fava, 2002). Major depressive episodes have also been described as a substantial burden of subjective anguish and can impair social and work productivity (Goldney, Wilson, Fisher, & Cheok, 2000). It is estimated that depression will compare in burden of disease morbidity to nearly all other known medical illnesses of this era (Greden, 2001). Depressed individuals score on average 77.6% of normal ability when assessing physical functioning (Wells et al., 1989).

Depression is also the most substantial risk factor for suicide. About 21% of individuals with recurrent depressive disorders and 18% of the individuals with dysthymia attempt suicide (Sartorius, 2001). Individuals with some form of depression comprise about two-thirds of all completed suicide attempts (Sartorius, 2001). In addition, in the United States, approximately $43.7 billion per year in significant disability and financial cost is attributed to depressive conditions (Greenberg, Stiglin, Finkelstein, & Berndt, 1993). Individuals that have been diagnosed with depression have been shown to have considerably higher annual health care costs ($4,246 vs. $22,371) and higher expenditures for every type of health care, including primary care, specialties, prescriptions, and lab work than their undiagnosed counterparts (Simon, VonKorff, & Barlow, 1995).

Depressive symptoms can also go unrecognized and consequently left untreated for some time due to the enduring stigma connected to mental illness or due to symptoms easily masked as physical ailments (Fava, 2003; Sartorius, 2003; Schomerus et al., 2012; Simon, Ormel, VonKorff, & Barlow, 1995). Symptoms can also be

misdiagnosed or undiagnosed altogether (Fava, 2003). In fact, a large proportion of the population with depressive disorders do not receive mental health care and many people are unaware that effective treatment can alleviate symptoms (Sartorius, 2003). It is estimated that nearly 50% of all individuals residing in developed countries who have depressive disorders do not seek treatment; of those who do, half of those remain undiagnosed (Maj & Sartorius, 2003).

Proper diagnosis of depressive disorders and appropriate attention has noteworthy and long-term effects on patient outcomes. Angst, Stassen, Clayton, and Angst (2002) found that mortality among patients diagnosed with depressive disorders has been found to be higher than that of individuals in the overall population. In 1990, unipolar depressive disorders were among the leading reasons for the world's disease burden and the World Health Organization and the World Bank projected that depression will be the second most substantial health issue overall by the year 2020 (Murray & Lopez, 1997). Consequently, appropriate treatment of depressive disorders could reduce the burden of illness overall (Sartorius, 2003).

Rural Communities and Depression

Depression in rural communities is of particular concern due to the unique characteristics of rural communities outlined above. There have been several substantial rural health concerns recognized in the United States including suicide, depression, and lack of access to health and mental care (Fortney, Owen, & Clothier, 1999; Gamm, Stone, & Pittman, 2003). Suicide occurs at higher rates in rural communities (Singh & Siahpush, 2002) and, in fact, is the second most prevalent cause of mortality in areas of

the country where predominantly rural populations are found ("Lost in Rural America," 2005). Overall, since the beginning in the latter part of the 1990s, rural areas have experienced suicide rates 54% higher than urban areas (Bishop, 2009).

One study by Amato and Zuo (1992) found no differences between urban and rural populations regarding depression. The authors investigated data from the National Survey of Families and Households and ultimately concluded that there were substantial interactions between gender, race, family status and rural and urban poverty. Among the more significant findings was that the psychological welfare of rural, impoverished African Americans was better than that of poor African Americans living in more metropolitan regions.

The South Carolina Health Center (SCRHC) initially found that the occurrence of major depression in rural residents in the US was significantly higher (6.11%) than found in urban residents (5.16%). The SCRHC analyzed data collected by the National Health Interview Survey (NHIS) in 1999 containing the Composite International Diagnostic Interview Short Form (CIDI-SF). Face to face interviews were conducted with over 30,000 individuals in the US to administer the survey. Once the population characteristics were adjusted for, the SCRHC did not find any difference by rural status regarding depression. The group further found that the occurrence of depression in rural households appeared to be a result of the population containing a higher proportion of people with self-reported fair or poor health, individuals who had limitations in daily activities, or individuals who had had a change in their health status in the previous year (Probst, Laditka, Moore, Harun, Powell, & Baxley, 2006).

Additionally, after examining the findings between two depression scales given to the same rural-urban counties four years apart, Brossart et al. (2013) not only found similar findings between the two instruments used to determine depression prevalence, but also established that depression rates were not higher in the rural sample. Overall, the patterns of depression scores were consistent across both surveys. The two depression scales used to measure depression were the Center for Epidemiologic Studies Depression Scale-5 (CESD -5; Shrout & Yager, 1989) and the Patient Health Questionnaire-9 (PHQ-9; Spitzer, Kroenke, & Williams, 1999), in 2006 and 2010, respectively. In analyzing the data, scores were divided by gender and ethnicity and, overall, the CESD-5 produced higher scores across both groups. Findings indicated that White participants had the smallest percentage of those reporting higher levels of depression, with Hispanics falling somewhere in the middle, and Black/African American participants having the highest percentage of the three groups regardless of rural status. It is significant to note that of all groups in both surveys, Black/African American women and Black/African American men had the highest depressive symptom reporting rates, respectively. These findings indicate a need for further investigation into the environmental factors that improve the mental health and general welfare of individuals living in rural parts of the country, particularly for minorities.

Outcomes would suggest that although there is a difference in rates of depression between rural and urban populations, these differences are due to different population factors. Rural populations are notably different from their urban counterparts in a variety of ways and discovering which core characteristics of this population contributes to the

increase of depressive symptoms may lead to appropriate and increased interventions, thus alleviating symptom burden.

Household Food Insecurity

Because rural populations possibly differ from their urban counterparts in inherent ways, intrinsic factors are worthy of investigation, and could potentially be tied to health and mental health variations within the population. The following section will discuss household food insecurity and its potential impact on rural populations. Food insecurity has been defined as "anxiety about running out of food or running out of money to purchase more food" (Hampl & Hall, 2002, p. 919). In the United States, approximately 14.5% or 17.2 million households were food insecure at least some time during 2010. Of this group, 5.4% were categorized as very low food secure. These groups reported that in the previous year, at least one household member had reduced their food intake and their eating patterns were altered during periods throughout the year when funds ran low or there was a lack of other resources (Coleman-Jensen, Nord, Andrews, & Carlson, 2011). In the same year, the average household coping with food insecurity spent 27% less on food than the same sized household not having to cope with the same issues (Coleman-Jensen et al., 2011). Although it may seem that only households with really low-SES experience food insecurity, data reveals otherwise. In 2010, 59.8% of households were considered food secure indicating that 40.2% of the population met guidelines for falling below the national level of poverty and were considered food insecure. Approximately seven percent of households with earnings above 185% of the poverty line were also thought to be food insecure in the year 2010

(Coleman-Jensen et al., 2011). Household food security can be threatened when household dynamics change such as fluctuations in medical expenses, holiday shopping, loss of employment, or changes of household budget (Tarasuk & Beaton, 1999).

Household food insecurity (HFI) has been hypothesized to manifest through two routes, each equally as significant. First, household food insecurity is connected to a nutritional pathway. This path is characterized by food insufficiencies in both quantity and quality (Black, 2012). The second course that facilitates HFI is a caregiver mental health pathway. This pathway is associated with the lack of food and is often expressed through depression and anxiety (Black, 2012). Although there has been much research to assess the relationship between HFI and children's behavioral and mental health outcomes (Belsky, Moffitt, Arseneault, Melchior, & Caspi, 2010; Connell, Lofton, Yadrick, & Rehner, 2005; Kursmark & Weitzman, 2009; Slack & Yoo, 2005), there is inconsistent research defining the relationship between HFI and adult mental health.

Food Insecurity and Rural Populations

Although household food insecurity is not exclusively a hardship experienced by low-socioeconomic populations, individuals living in rural areas may be particularly at risk due to environmental and systematic factors that may help make families food insecure or help keep them in a state of food insecurity. Studies have shown that households that are food insecure often consume food that is inexpensive and is deficient in nutrients (Cole & Fox, 2008; Drewnowski & Specter, 2004; Olson, Bove, & Miller, 2007) to guarantee they have enough food to eat. The sacrifice of nutritious food can have harmful consequences on health outcomes. One study showed that children who

came from low-SES, food insecure homes ate less calories, less fruit, and had higher cholesterol levels than children from higher income food secure homes (Casey, Szeto, Lensing, Bogle, & Weber, 2001). Dietary regimens that are low in nutrients can increase the risk of health issues such as micronutrient deficiencies or obesity in children (Skalicky et al., 2006). Determining causal effects for food insecurity can also be challenging since it occurs at higher rates in families that are at greater risk for obesity (Black, 2012).

Rural residents are also less likely to have access to and availability of healthy food options (Treuhaft & Karpyn, 2010) and areas of increased food concentration known as "food deserts" (Morton, Bitto, Oakland, & Sand, 2005). Food deserts have been identified as locations with limited or no accessible nutritious and affordable food (Cummins & Macintyre, 2002; Treuhaft & Karpyn, 2010). Research also indicates that individuals who live in food deserts are less likely to consume five or more daily fruits and vegetables (Blanchard & Lyson, 2003). This limitation of healthy food intake can have an impact on the economic growth of rural areas when there are increased costs in health care expenditures and overall poor health among the work force (Blanchard & Lyson, 2003).

Based on the limited access to healthy food options, rural residents may have to drive long distances to purchase food items (Blanchard & Lyson, 2003) or if they lack transportation, may have to walk to the nearest store to purchase their food (Ver Ploeg et al., 2009). They may also have to settle for reduced or unhealthy food options at convenience stores or local shops (Short, Guthman, & Raskin, 2007) or resort to eating

at fast food restaurants which have become increasingly available in rural neighborhoods (Dunn, Sharkey, & Horel, 2012).

Supplemental Nutrition Assistance

Additional factors may impact rural populations and could help define their uniqueness differentiating them from urban populations. The following section discusses supplemental nutrition assistance programs and their potential influence on rural residents.

The Food and Nutrition Service of the United States Department of Agriculture offers children and low-income adults access to food, regular meals, and education regarding proper diet. These programs include, but are not limited to, the Child Nutrition Programs, the Special Nutrition Assistance Program for Women, Infants, and Children (WIC), and the Supplemental Nutrition Assistance Program (United States Department of Agriculture, 2012d).

The Child Nutrition Programs (CNP) consist of several services that provide children in school with lunches, milk, or nutrition education and include the National School Lunch Program, the School Breakfast Program, and the Summer Food Service Program (United States Department of Agriculture, 2012e). Two of the most widely known CNP programs, the National School Breakfast Program and the National School Lunch Program, are federally assisted and provide free or inexpensive breakfast and lunch to children in public and nonprofit private schools. The programs provide meals to children in residential care organizations as well. The Lunch Program also gives children

the chance to practice learned nutrition skills (United States Department of Agriculture, 2012c).

The number of children who have participated in both programs has grown steadily over the years. In 2000, 7.5 million children used both the School Breakfast program and the National School Lunch program. Throughout the 2011 fiscal year, 12.1 million children partook of the School Breakfast program daily. Just over 10 million of those participants acquired free or reduced-cost breakfast. In the same year, the National School Lunch Program had almost 32 million daily participants. Since 1947, when the modern lunch program was created, more than 224 billion lunches have been served. In 2011, the School Breakfast Program cost $3.0 billion and the National School Lunch Program cost $11.1 billion to maintain (United States Department of Agriculture, 2012c; United States Department of Agriculture, 2012f).

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) aimed at those who are nutritionally at risk, provides healthy food options, information, and referrals to its participants regarding how to eat healthily (United States Department of Agriculture, 2012g). WIC is utilized by pregnant and postpartum women who meet low-SES guidelines, or women who are breastfeeding. Infants and children up to five years old can also partake of the service (United States Department of Agriculture, 2012g). WIC participants must meet particular criteria including state residency and be at nutritional risk. Nutritional risk includes medically based risks like anemia and underweight, as well as dietary risks such as inappropriate nutrition practices (United States Department of Agriculture, 2011). The Food and Nutrition Service, is

funded at the federal level, and offers financial assistance to states who participate in the WIC program. These funds help cover administrative fees, WIC appropriate foods, and education and support regarding breastfeeding and overall nutrition (United States Department of Agriculture, 2012g). Just over 9 million individuals participated in the Women, Infants, and Children program in the 2010 fiscal year. For the fiscal year 2011, Congress set aside $6.7 billion to help maintain the program (United States Department of Agriculture, 2011).

The Supplemental Nutrition Assistance Program (SNAP), previously known as Food Stamps, was created to help low-SES households with financial aid and to help acquire food and is the principal food assistance program in the US (Kirlin, 2012). Specific income and resource criteria must be met in order for an individual to qualify for SNAP benefits. A considerable amount of public spending is dedicated to supplemental nutrition assistance each year, in fact, at least two-thirds of USDA's annual budget is spent on nutrition assistance programs (Oliveira, 2012). In 2009, the Supplemental Nutrition Assistance Program served an estimated 33.5 million people utilizing $50.3 million (United States Department of Agriculture, 2012a). In 2011, almost 45 million people were served and almost $72 million was used. Between fiscal year 2008 and fiscal year 2009, there was an 18% increase in SNAP participants and a 15% increase in eligible individuals. Several factors including economic factors, changes in SNAP eligibility, and ongoing outreach, were likely the cause for the increase in participants (United States Department of Agriculture, 2012a).

Some families that may be eligible to receive nutrition benefits never receive them due to organizational obstacles or lack of funding (Cook et al., 2008; Gayman et al., 2010; Jeng, March, Cook, & Ettinger de Cuba, 2009; Perry, Ettinger de Cuba, Cook & Frank, 2007). Because of inadequate funding, benefits can be either too low or may run out sooner than households need which may keep them from purchasing items that are part of a well-balanced diet. Average SNAP benefits have been found to fall far below actual expenses for a healthy diet (Thayer et al., 2008). This cycle of higher rates of spending early in the month, followed by little to no money until funds are replaced, is often called the 'boom and bust cycle' (Jensen & Wilde, 2010). This cycle can potentially add to the stress of everyday living and the anxiety of trying to figure out how funds will be stretched until the end of the month or where meals will come from.

Supplemental Nutrition Assistance and Rural Populations

Twenty-five percent of all Americans participate in some supplemental food assistance program throughout the year at any given time. In analyzing data from the Consolidated Federal Funds Reports of 2010, income security programs, which include the Supplemental Nutrition Assistance Program (SNAP), accounted for two-thirds of all national aid in rural areas. This compares to urban areas that accepted a little over 50% of their federal funds in income security programs (Reeder & Bagi, 2012).

Rural populations face special challenges when it comes to nutrition assistance. Rural residents may not only have difficulties acquiring benefits for which they may be qualified, but rural areas are also comprised of lower population densities. Consequently, grocery stores are located miles apart and often far away from where people need them

(Bailey, 2010). In these grocery stores, food prices are often higher than those in larger suburban stores where competition drives prices down (Morris, Neuhauser, & Campbell, 1992). Individuals that redeem their benefits at these smaller markets or convenience stores may consequently use up more of their allotted funds due to higher pricing. Subsequently, individuals living in households with lower incomes also tend to consume diets with less nutritional value eating fewer fruits and vegetables as well as fewer whole grains and low-fat dairy products than recommended by federal guidelines when compared to other households (Golan, Stewart, Kuchler, & Dong, 2008). This may be in part due to less availability of healthier food options in their local, smaller markets and convenience stores.

Since 2007, the rate of household participants in the SNAP program has increased. Data from the 2007 and 2009 American Community Survey from the United States Census Bureau was used to estimate rates of SNAP use across rural populations. Bean and Mattingly (2011) found that rural households are more likely to rely on nutrition assistance regardless of where they are in the nation with 13.2% of rural households receiving benefits in 2009 compared to 7.7% in suburban areas. In 2010, 15% of rural households received benefits (Bean & Mattingly, 2011; Bean, 2011). Southern regions used SNAP benefits the most with 15.8% of the total population receiving benefits. African American households used SNAP benefits the most in rural areas at 30.8% compared to their Hispanic counterparts at 21.4% and White households at 11.3% (Bean & Mattingly, 2011). Even though rural areas see a greater use of SNAP benefits, less than 50% of rural households with incomes below the poverty line partake

in SNAP benefits (Bean & Mattingly, 2011).The Economic Research Service of the USDA found that SNAP assistance lowered the depth and severity of poverty in both metropolitan and nonmetropolitan areas, with a greater reduction in poverty among individuals in rural areas between 2000 and 2009 (Tiehen, Jolliffe, & Gunderson, 2012).

Rural Disparities and Racial/Ethnic Minorities

It is important to mention that specific populations within rural areas are shown to experience worse conditions than other members of the community. Probst, Moore, Glover, and Samuels (2004) designated rural/ethnic minorities "a forgotten population" (p. 1695). Minority populations residing in rural areas experience health and mental health care disparities more severely than those living in urban areas as is evidenced by a dearth of research addressing these distinct populations (Probst et al., 2004). Some minority groups, Hispanics in this case, have been shown to demonstrate a difference in participation in preventive care when compared to their White counterparts. Preventive services with limited utilization include particular health exams and screenings (Corbie-Smith, Flagg, Doyle, & O'Brien, 2002). Cancer screenings are also less likely among minorities living in rural areas (Cornelius, Smith, & Simpson, 2002; Thompson et al., 2002).

These minority disparities have been partially attributed to marginalized individuals living together in rural communities. In these communities, there have also been restricted educational and economic opportunities further leading to disparities (Probst et al., 2004). As previously noted, Brossart et al. (2013) found that African Americans, women in particular, had the highest percentage of depressive symptoms in

surveys conducted four years apart in a rural setting. Because minority groups are frequently misdiagnosed and have inferior treatment outcomes across settings (Ridley, 2005) ethnic minorities living in rural areas may be particularly at risk for increased barriers to health and mental health treatment.

Relationship among Other Variables

Numerous studies have been conducted to describe the relationship among the previously mentioned variables. The following section describes outcomes of studies investigating at least two of the variables, and then finally between all three variables.

Food Insecurity and Supplemental Nutrition Assistance

At some point in the year 2010, approximately 14.5% of all American households were considered food insecure. In the same year, 59% of all homes that would be considered food insecure participated in one or more food assistance programs during the month prior to administration of the 2010 Current Population Survey administered by the USDA (Coleman-Jensen, Nord, Andrews, & Carlson, 2011). The United States Census Bureau conducts this survey every year to collect information about hunger, food insecurity, and nutrition assistance program participation in American households. Literature concerning the effect of supplemental nutrition assistance on food insecurity can be confusing and contradictory. There is abundant literature showing that participation in the supplemental food assistance programs may have inconsistent or no effects (Gibson-Davis & Foster, 2006; Gundersen & Oliveira, 2001; Huffman & Jensen, 2008; Jensen & Wilde, 2010; Nord & Golla, 2009).

Additionally, other studies have shown a reduction in food insecurity. A study conducted by Nord and Golla (2009) tried to examine household food insecurity month to month just before and also just after enrolling in SNAP benefits. The study found that food insecurity increased substantially seven to eight months prior to beginning benefits and was reduced soon after. The authors concluded that food insecure households are likelier to utilize SNAP benefits and therefore are likelier to be more food insecure at any given time than non-participants (Nord & Golla, 2009). This supports similar research findings (Jensen & Wilde, 2010; Nord, 2001).

Ratcliffe and McKernan (2010) found that participation in the food assistance program reduced food insecurity by approximately 30%. In a more recent study, Nord (2011) found that participants who had left the year-long program before the reporting period at the end of the last month when food insecurity was measured, were 28% likelier to report very low food insecurity than their counterparts who remained in the program throughout. This indicated that staying in the program helped reduce food insecurity when compared to that of those individuals who left the program. Nord (2011) found that SNAP improved the rate of food insecurity on very low food insecurity between 20-50%.

Studies also show that households that have been on nutrition assistance but leave the program also become increasingly food insecure. In analyzing 2 year panel data of households who left the SNAP, one such study found that there were two unique groups that followed (Nord & Coleman-Jensen, 2010). In the first group, some

participants who initially left the program after a year (one-third) returned and were likelier to endorse very low food security both pre and post their participation.
In the second group, participants left the program and did not return the second year of the study. Initially, they endorsed higher degrees of very low food security but were then likelier, than participants who remained in the program throughout, to endorse low rates of food insecurity by the end of the second year (Nord & Coleman-Jensen, 2010).

Other conflicting literature has shown that households across the country receiving SNAP benefits have been shown to experience higher levels of food insecurity (Alaimo, Briefel, Frongillo, & Olson, 1998; Cohen et al., 1999; Jensen, 2002; Jensen & Wilde, 2010; Nord, 2001; Ribar & Hamrick, 2003; Wilde & Nord, 2005). With these numerous and variant outcomes, further investigation is needed to understand effects of SNAP program participation on food insecurity.

In searching for literature describing the effects of the Women, Infants, and Children food program on food insecurity, two studies were found. Metallinos-Katsaras, Gorman, Wilde, and Kallio (2011) investigated the relationship between women and children's length of participation in the WIC program and their food security. The study evaluated the household food insecurity of individuals receiving WIC benefits from years 2001 to 2006 and included a portion of the USDA Food Security Module. The total number of participants was 79,240; however, this included mothers and their participating children. Of those participating, 21,863 were adult women. The women in the group were approximately 22.6 years old and about 31.3% of the group reported being food insecure.

Noteworthy interactions were found examining what trimester the women were in when they started participating in the WIC program and their prenatal food insecurity status (Metallinos-Katsaras et al., 2011). For those who were household food insecure and reported hunger as well, the threat of food insecurity after giving birth to their child was drastically lowered when they entered the program in either the first or second trimester of pregnancy (Metallinos-Katsaras et al., 2011). Women entering the program in their third trimester of pregnancy increased the likelihood of food insecurity by 39% compared to those who entered the program in their first. Only 23.3% of the adult women reported household food insecurity by their postpartum visit (Metallinos-Katsaras et al., 2011). This study demonstrated that earlier and longer participation in the WIC program might improve household food insecurity.

Another study by Bitler, Gunderson, and Marquis (2005) was conducted to determine if WIC program benefits were reaching individuals at nutritional risk using household access to food. Food insecurity was used as the indicator of nutritional risk, which is not specifically a target of the WIC program. This study also helped determine if WIC eligible participants who do receive benefits are more or less food insecure than eligible individuals who do not receive benefits. Bitler et al. (2005) used multipanel longitudinal survey data from the 1996 Survey of Income and Program participation (SIPP). This survey is managed by the United States Census Bureau and includes questions of food insecurity and WIC eligibility based on annual income. Findings indicated that for the higher rated item of food insecurity, when the household "sometimes or often did not have enough to eat", there was no statistical difference

between WIC participants and those who were eligible but not participating (Bitler et al., 2005). For the second and third items, "food bought sometimes or often did not last "and "sometimes or often did not eat balanced meals", women participating in the WIC program were much more likely to be food insecure than eligible individuals not participating (Bitler et al., 2005). Results from the study indicated that both WIC recipients and non-recipients are equally likely to feel they do not have enough food. The food insecurity measures demonstrated further that those in greater need were more likely to use WIC benefits (Bitler et al., 2005).

Food Insecurity and Mental Health

Food insecurity has also been shown to have a negative impact on overall mental health. Conger et al. (2002) proposed a family stress model which indicated that families having limited financial resources may have to make challenging choices between basic needs. These needs often include health care, housing, and food. Frustration and stress can result from making these difficult decisions (Wickrama, Conger, Lorenz, & Jung, 2008).

In general, some associations have been made between food insecurity and mental health. A recent study explored the association between HFI and depression in mothers to determine which predicted the other. A multiple state investigation of low-socioeconomic status rural families called 'Rural Families Speak' used the Core Food Security Module to measure food insecurity and the Center for Epidemiologic Studies - Depression Scales to measure depression. After missing values were substituted, analysis of a sample of 413 subjects demonstrated that there was a bidirectional

association between HFI and maternal depression (Huddleston-Casas, Charnigo, & Simmons, 2009). Similarly, another study of longitudinal data attempted to assess the association between depression and food insecurity. Data was obtained from 29 rural families in New York and findings indicated that positive endorsement of depressive symptoms and poor mental health among mothers increased the chances that the family remained food insecure (Lent, Petrovic, Swanson, & Olson, 2009).

Attempting to understand a more global effect of food insecurity on mental health, a systematic literature review was conducted regarding the effects of food insecurity. The focus of this literature was only, however, on developing nations. Weaver and Hadley (2009) included both qualitative and quantitative studies in their review and found that of the 11 qualitative studies explored, they all demonstrated a strong association between food insecurity and increased symptoms of a mental disorder such as anxiety or depression. The standards used to identify participants as food insecure were not clearly stated in many of these longitudinal studies. In addition, symptoms of mental health were handled as a final result, instead of a possible source of food insecurity. The overall concept of the qualitative investigations was that food insecurity is a troubling experience, both physically and emotionally, that places psychological and overall well-being at risk (Weaver & Hadley, 2009).

Consistently across all 16 quantitative studies, findings indicated that there was a relationship between food insecurity and at least one indicator or symptom of a common mental disorder. For these studies; however, study designs, samples, and assessments of food insecurity differed greatly. Only 6 of the 16 studies focused on women differing

from the qualitative samples and most of the studies in the review used only one question to assess for food insecurity. Overall results indicated that there were variable levels of support for associations between food insecurity and a mental disorder. Approximately two-thirds of the studies indicated a positive relationship between food insecurity and lowered mental health and there were no studies indicating a negative relationship between the two variables (Weaver & Hadley, 2009). Although the systematic review consisted of literature of studies in developing countries, results are meaningful in that a positive relationship has been established between poor mental health and food insecurity.

In the same year, Gorton, Bullen, and Mhurchu (2009) examined 78 articles primarily consisting of cross-sectional or qualitative studies reviewing environmental influences on household food insecurity in countries with high-SES including the United States. The findings of these studies indicated that there were several elements linked with food security. The leading factor was the accessibility of financial resources for the home. The majority of the studies did not assess other interventions besides the SNAP to reduce food insecurity.

Supplemental Nutrition Assistance and Mental Health

There is limited literature on the effects of supplemental nutrition assistance and mental health. Elliott (1996) found that women who do not work for pay may have lowered self-esteem and may diminish the importance of homemaking activities. Elliott (1996) also found that the women on welfare exhibited more symptoms of distress and lower self-esteem than their counterparts not receiving assistance. Elliott (1996)

hypothesized that the effect of receiving welfare may increase over time as women shift their perception of being on welfare from temporary and beyond their control to a long-term state that marks their own personal failure. This study had some limitations, however. Although Elliott focused on the self-esteem of the participants, this study did not focus on mental health or depression specifically such as will be the focus of this dissertation. In this study, the construct of welfare was not limited to supplemental nutrition assistance; the term "welfare" is not clearly defined. Further study is needed to understand how depression specifically is related to participation in nutrition assistance programs.

Some studies have found connections between mental health issues and welfare dependence (Belle, 1990; McLoyd, 1990). In one such study, Taylor (2001) examined work attitudes, barriers and experiences, service usage, ambitions, mental health issues, and social support among rural welfare participants. Fifty mothers living in a rural area receiving welfare were interviewed. Self-efficacy and self-esteem were related with higher levels of perceived social support while depression symptoms were related with lower levels of perceived social support. Taylor (2001) found relationships between perceived barriers such as lack of accessible employment, transportation issues, child care, individual mental health, and self-efficacy. One criticism of the study, however, is that the focus was on welfare and not on supplemental nutrition assistance, specifically.

Food Insecurity, Supplemental Nutrition Assistance, and Depression

To date, studies have focused on the health and mental health outcomes of children coping with food insecurity (Ashiabi & O'Neal, 2007; Casey, Szeto, Lensing,

Bogle, & Weber, 2001), the relationship between food insecurity and post-partum mothers' health and mental health (Laraia, Borja, & Bentley, 2009; Mathews, Morris, Schneider, & Goto, 2010), and the positive relationship between poor maternal mental health and the limited likelihood that households would become food secure (Lent, Petrovic, Swanson, & Olson, 2009). These studies are limited in that they used samples of convenience only focusing on participants using benefits from the Women, Infants, and Children program or they focused primarily on children.

In seeking literature discussing food insecurity, supplemental nutrition assistance, and mental health, few studies were found. One such study, Casey et al. (2004) investigated the relationship between positive report on a depressive screen and loss of or reduced welfare/food stamps, household food insecurity and child health outcomes. The sample included mothers who brought their children to six different urban hospitals and clinics in five states and Washington, D.C. over the course of two years, between January 1, 2000 and December 31, 2001. Approximately 5,300 mothers were interviewed. Welfare or financial support was defined as Temporary Assistance to Needy Families (TANF) assistance. The findings indicated an association between individuals who endorsed losing their welfare/food stamp benefits and household food insecurity and a positive depression screen. In this study, the direction of effects was also not able to be determined (Casey et al., 2004). One limitation of this study is that data was collected in urban hospitals and clinics. It is unclear if the participants were traveling in from more rural locations or if they were residents from these urban locations. A second limitation is that these participants had either received TANF

benefits in the past 12 months or were currently receiving TANF. These benefits include other financial assistance besides nutrition assistance benefits such as was the focus of this study.

A second study found, Black et al. (2012), was a similar to Casey et al. (2004) in that participants were recruited from hospitals or primary care clinics. The authors focused on the relationship between HFI and/or self-reported guardian depressive symptoms and child health outcomes. The role of WIC program participation and how it may have reduced child health concerns was also examined. Interviews were conducted between January 1, 2000 and December 31, 2010 and included mothers who were WIC eligible, meaning they had children younger than three years old. There were almost 27,000 participants in the overall sample and findings indicated that 9.1% had both depressive symptoms and household food insecurity. Just over 89% participated in the WIC program. WIC participants were less likely to indicate HFI and depressive symptoms than non-participating individuals. The results indicated that as stressors increased in the maternal sample, positive child health status decreased. Findings indicated that WIC participation reduced overall health risks in children (Black et al., 2012). Again, the limitations of the study included that the data was collected from urban locations and the focus of the investigation was the stress related health risks of children.

Another study, Kim and Frongillo (2007), investigated nutrition assistance, mental health effects, and food insecurity. This study examined the association between food insecurity and depression in individuals between the ages of 51 and 61 and

examined how nutrition assistance program participation modified the effects of these two variables. Findings showed that individuals who did not participate in nutrition assistance programs were more likely to be depressed than those who did participate. The participation in a nutrition assistance program was operationalized as receiving food stamps within the two years prior to data analysis or having food delivered to their homes as part of a food program.

In a related study, Heflin and Ziliak (2008) concluded that individuals utilizing food stamps endorsed higher levels of emotional distress associated with food insufficiency. This was, however, dependent on the amount of financial assistance received from each participant. The authors determined that individuals, who were higher in food insufficiency, were also reporting higher levels of emotional distress than their counterparts who reported high levels of food insufficiency but received fewer funds. Moreover, it seemed that at least while participants were applying and first receiving benefits, the unfavorable mental health outcomes of program participation seemed higher than the positive mental health outcomes (Heflin & Ziliak, 2008).

Rural Populations and Barriers to Treatment

Rural populations differ from urban populations in that they have barriers of availability, accessibility, and acceptability that keep them from getting the health and mental health care they need (Gustafson, Preston, & Hudson, 2009; Health Resources and Services Administration, 2005; Jameson & Blank, 2007; "Lost in Rural America," 2005). Studies have shown that rural populations are more likely than their urban counterparts to report having poor health, are at greater risk of having health concerns,

and are more likely to report restrictions in everyday activities caused by enduring conditions (Auchincloss & Hadden, 2002; Bennet, Olatosi, & Probst, 2008; Committee on the Future of Rural Health Care, 2005; Probst, Laditka, Moore, Harun, & Powell, 2005).

Individuals seeking treatment who live in rural areas are burdened by higher rates of poverty, inadequate housing and transportation, long travel times for treatment, lower rates of insurance or being uninsured, a culture of autonomy, lack of culturally acceptable treatments, lack of privacy in the community, and stigma (Hauenstein et al., 2007; Sawyer, Gale, & Lambert, 2006; Stamm et al., 2003; Wagenfeld, 2003). Individuals with diagnosed disease living in rural areas may also experience disparities in treatment. African American adults with diabetes living in rural areas demonstrate poorer control than individuals in urban areas and adults over the age of 65 have demonstrated increased rates of tooth loss when compared to their urban peers (Mainous, King, Garr, & Pearson, 2004; Vargas, Dye, & Hayes, 2002). Vargas et al. (2002) reported that individuals living in rural areas experience less access to dental services overall (Vargas et al., 2002).

The stigma of seeking and obtaining mental health treatment is well recognized throughout the literature and is of special relevance for rural populations. In one study, the help seeking behavior and mental health service experiences of rural African American mothers was assessed. The sample consisted of mothers living in Georgia who sought services for their adolescent children who were experiencing issues with their mental health. Findings indicated that participants favored relying on family, their

church, and their child's school as a means of support even when mental health care providers were available. Participants frequently reported stigma in the community towards children with mental health issues as an obstacle to help-seeking (Murry, Heffinger, Sulter, & Brody, 2011). Individuals in rural communities often know everyone who lives around them and therefore confidentiality is difficult to maintain which may cause individuals to avoid treatment altogether (Gustafson, Preston, & Hudson, 2009).

Rationale for the Study

Due to the lack of mental health providers, high rates of suicide and depression, and barriers that rural populations face, it is imperative that other avenues of alleviating depressive symptoms be explored as well as identifying the underlying causes of depression or possible health indicators that contribute to this debilitating disorder. Although there are numerous studies describing the bidirectional nature between depression and food insecurity, there remains a gap in the literature indicating the role supplemental nutrition assistance plays within this relationship and how rural residence relates to these variables overall.

Among the studies that do examine this relationship, the focus includes TANF, which does not focus solely on food assistance and these articles focus on child health/mental health outcomes. Adult mental health is not the focus. To the author's knowledge, there were no studies explicitly focused on the depressive symptoms of adults and how they may be impacted by household food insecurity and utilizing nutrition assistance programs. Given the literature regarding hardships experienced by

rural populations, there is a great need to examine the role of participating in a supplemental nutrition assistance program when exploring intervention alternatives for depressive symptoms. It is likely that other factors are associated with, or moderate, different levels of depression and the design of this study allowed for an examination of the influence of food insecurity and supplemental nutrition assistance in the prediction of depression in the context of such other variables.

Research Questions and Hypotheses

This study addressed the following research questions:

1. What is the correlation between food insecurity and depression in a large sample of individuals living in rural counties?
2. What is the correlation between participation in a supplemental nutrition assistance program and depression in a large sample of individuals living in rural counties?
3. Does food insecurity contribute significantly to the prediction of depression independent of other relevant factors such as participation in a supplemental nutrition assistance program, age, gender, race, and income?

Based on prior research, I hypothesized that:

1. Food insecurity would be positively correlated with higher depression scores.
2. Individuals reporting participation in a supplemental nutrition assistance program within the last 12 months would report higher depression scores than those not participating in a supplemental nutrition assistance program.

3. Food insecurity will significantly predict depression above and beyond participation in a nutrition assistance program, gender, and rural residence for each ethnic group.

III. METHOD

Participants

This study relied on a secondary dataset consisting of survey data collected for a community health assessment by the Center for Community Health Development (CCHD) and the Brazos Valley Health Partnership (BVHP) in the Brazos Valley. The survey was created to gather health status information of individuals living in the Brazos Valley and is conducted in this area every four years to better address the needs of the population. Surveys were completed without identifying information such as name or address. Participants were from seven rural and one urban county located in the Brazos Valley in South Central Texas. The counties from which data was used included Brazos, Burleson, Grimes, Leon, Madison, Robertson, Washington, and Waller counties. Individuals from these eight counties, 3,924 more specifically, participated in the survey and included persons from various ethnic groups including White, African American, Hispanic, Asian or Pacific Islander, and Native American. The age range of participants was 18 to 99 ($M = 58.5$, $SD = 15.3$) but fell mainly between 18 and 65. The sample also consisted predominantly of females (70.6%) and had a self-reported ethnic breakdown as follows: White (84.6%), African American (9.1%), Hispanic (10.4%), and Other race/ethnicity (2.9%).

Health Survey

The health survey used to collect data consisted of approximately 80 questions and asked about numerous health domains. These domains included: overall health, medical history and health habits, how often they engage in physical activities, access of

health care services, transportation issues, food and nutrition, health insurance, community services and community demographics, and psychological well-being. In addition, other demographic and personal information was collected and all questions were collected by self-report. Participants were able to relay information for investigators to understand the communities' health habits and concerns and what concerned that individual about their community the most.

Procedure

As previously stated, a household survey was conducted in 2010 in the Brazos Valley as part of a regional health status assessment. The number of surveys disseminated was determined based on population estimates and a target number for each county was calculated. Fifteen thousand households were randomly selected from a list of residential addresses and letters were mailed to them notifying them of their selection. Table 1 indicates the population of each county in the sample as well as the surveys collected from each county proportional to the total sample. After all surveys had been collected, forty participants (1%) did not indicate what county they resided in and were therefore not assigned to a particular county. These participants were, however, included in the total number of surveys (3,964) completed.

Table 1

County Population and Survey Response

County	Total Population	% of Regional Population	Targeted # of Surveys	Total Surveys Completed	% of Total Sample
Brazos	19485	53.7%	900	1088	27.4%
Burleson	17187	4.7%	250	399	8.6%
Grimes	26604	7.3%	250	326	8.2%
Leon	16801	4.6%	250	400	10.1%
Madison	13664	3.8%	250	271	6.8%
Robertson	16622	4.6%	250	358	9.0%
Waller	43205	11.9%	425	586	14.8%
Washington	33718	9.3%	425	556	14.0%
Total	36265	99.9%	3000	3964	98.9%

One week after receiving the letter, potential participants living in the eight counties received recruiting phone calls. A randomization system was used to select residents to call. When calls were answered, the survey conductor would ask for the adult living in the home whose birthday would occur next. If that person came to the phone, details of the survey would be explained to them and they would be given the opportunity to participate. If they agreed, an instructional packet with the survey was sent via mail to their home. Participants were instructed how to return the completed packet within one week. The survey, available in both English and Spanish versions, was estimated to take 45 minutes to complete. Ultimately, 12,240 individuals were reached by telephone, and 6,354 agreed to participate (51.9%). Sixty-two percent of individuals who agreed to take the survey (3,964) inevitably returned it for an overall

response rate of 32%. There were no surveys returned in Spanish. SPSS was used to manage and analyze the data.

Measures

Predictive Variables

Food Insecurity

The modified Radimer-Cornell, a measure of hunger and food insecurity (Kendall et al., 1995), was incorporated as part of the complete health survey sent in the instrument packet. The Radimer-Cornell measure was originally constructed using in-depth interviews and previous research from Cornell University identifying issues of hunger and food insecurity (Kendall et al., 1995). From Radimer's initial interviews, two pathways of hunger and food insecurity developed. The first pathway dealt with insufficient intake of food and food restriction, along with the physical feelings associated with being hungry. The second pathway included household problems with food supply, diet quality, feelings regarding the household food situation, and what the household did to alleviate issues with lack of food (Kendall et al., 1995).

The Radimer-Cornell was validated in rural New York using data from 193 households. Two phone interviews were conducted approximately three weeks apart and during both interviews women of the household were asked about the food inventory existing in the home. All of the items in the interview survey were conveyed as declarations with response categories of "not true, sometimes true, or often true". Three hunger and food insecurity measurement categories resulted from factor analysis, including a household insecure measure, an individual insecure measure, and a child hunger measure. The authors found that internal consistency was 0.84, 0.86, and 0.85 for

the household insecure measure, the individual insecure measure, and the child hunger measure, respectively.

For some questions on the food insecurity scale, participants in the BVHSA were asked to choose a frequency measurement defined by “often true, sometimes true, and never true”. The variable was coded 0 for often true to 2 for “never true”. For other questions, participants were asked to answer “yes” or “no” regarding their eating habits in the last year. An additional food insecurity question regarding food restriction coded responses differently; 1 indicating “almost every month”, 2 for “some months but not every month”, 3 for “only one or two months”, and 4 for “never”. For this question, an endorsement of a 1 indicated that the person filling out the survey or another adult in the household reduced the size of meals because of money almost every month. For this scale, the smaller the number endorsed, the higher the rate of food restriction.

Some sample items from the current survey include: “During 2009, I worried whether my food would run out before I get money to buy more" and “In 2009, were you ever hungry, but did not eat because there was not enough money for food?” Household Food Insecurity (HFI) was calculated by obtaining respondent answers to two questions regarding household food insecurity. Two questions from the Radimer-Cornell Measure of Hunger and Food Insecurity were grouped to obtain an HFI score. The two questions used were *I worry whether my food will run out before I get money to buy more* and *The food that I bought didn’t last and I didn’t have money to buy more*. Each of these questions were answered using responses such as “often true”, “sometimes true”, “never true”, and “I don’t know”. Data were recoded to create a dichotomous variable.

Responses that were often true or sometimes true were coded as Yes. All other responses were coded as No. Answers of Yes were coded with a 1 and answers of No were coded with a 0.

Adult Food Insecurity (AFI) was calculated by obtaining respondents answers to three questions regarding adult food insecurity. Three questions from the Radimer-Cornell Measure of Hunger and Food Insecurity were grouped to obtain an AFI score. One question used was, *During 2009, I could not afford to eat balanced meals.* This question was answered using responses such as "often true", "sometimes true", "never true", and "don't know". Two additional questions used for AFI, included, *In 2009, did you ever eat less than you felt you should because there was not enough money for food,* and *In 2009, were you ever hungry but did not eat because there was not enough money for food?* These questions were answered using responses such as "yes", "no", and "don't know". All three questions were recoded to create a dichotomous variable. Answers of Yes were coded with a 1 and answers of No were coded with a 0.

Supplemental Nutrition Assistance, Age, and Gender

Knowing that supplemental nutrition assistance program participation as well as outside factors may influence the relationship between food insecurity and depression, this study investigated the role of nutrition assistance benefits and other demographic factors. The survey instrument included one item that asked if respondents participated in the Food Stamp Program in 2009. Participants were asked to respond either "yes" or "no" for this question. Additionally, a different question asked how many months in 2009 anyone in the household participated in specific food programs such as WIC or

Food Stamps. Participants were asked to circle a number from 0 to 12. Respondents that indicated that they had participated in the food programs one or more months were placed into the "yes" category. All others were placed into the "no" category. The questions were then recoded to create a dichotomous variable. Answers of Yes were coded with a 1 and answers of No were coded with a 0. These items were used to assess the relationship between supplemental nutrition assistance participation, food insecurity, and depression.

Criterion Variables

Patient Health Questionnaire-9

The Patient Health Questionnaire-9 (PHQ-9) was part of the complete survey mailed to residents in the Brazos Valley. The PHQ-9 consists of nine items and is criterion-referenced with a three-point Likert-type response format. Answers range from "not at all" to "nearly every day". The questions investigate the mental and emotional health of individuals within the past two weeks. The nine items in the measure follow the *DSM-IV-TR* diagnostic criteria for a major depressive episode in format and temporal framework. The PHQ-9 is an appropriate measure to use when seeking normative data regarding depression among residents living in rural areas who traditionally may pose their mental health concerns in clinics or primary care locations given that the tool was initially intended for clinical and medical settings (Probst et al., 2006; Rost, Fortney, Fischer, & Smith, 2002).

The PHQ-9 is a form of the PRIME MD in which individuals self-report their symptoms of depression (Spitzer et al., 1999). Initially, this tool was validated using

individuals who sought services from eight primary care clinics. Within the total sample of 3,000 patients, 825 individuals had a resulting diagnosis with the PHQ-9. When comparing results of the individuals who were administered the PHQ-9 and those who were interviewed by independent mental health professionals with a resulting diagnosis, there was 85% overall accuracy, 75% sensitivity, and 90% specificity (Spitzer et al., 1999). The PHQ-9 screener for depression has been extensively used given that the average time required of the physician to review the PHQ-9 is approximately three minutes along with its satisfactory validity.

The PHQ-9 has several different scoring methods with different indications for follow up and treatment. Scores on the PHQ-9 range between 0 and 27; greater scores indicate more serious levels of depression. One scoring method ascribes a depression level to the individual's total score (0-4 no depression, 5-9 mild depression, 10-14 moderate depression, 15-19 moderately severe depression, 20-27 severe depression) (Kroenke et al., 2001). For the purpose of this study, a total score of 0-9 was placed into a *non-depressed* category and individuals who scored 10-27 was placed into a *depressed* category. The cutoff of 10 seemed appropriate and allowed for a conservative analysis. This method was used to identify a conclusion regarding depression in a rural-residing population.

Using factor analysis, Huang et al. (2006) investigated variations in responses between various ethnic groups as well as rates at which each item was answered and the functioning of each. For the PHQ-9, the authors found the internal reliability for African Americans was 0.80, for Chinese Americans was 0.79, for Latinos was 0.80, and for

non-Hispanic Whites was 0.86. Additional analysis revealed that within these populations, the tool measured a basic formulation of depression and is therefore suitable in detecting and observing the symptoms of depression in multi-ethnic populations.

Data Analysis

Descriptive statistics, Pearson correlations, and multiple regression techniques were used to address all research questions. SPSS software was utilized to perform all analysis. Basic descriptive analysis was completed to describe the sample and information such as mean age, ratio of men and women, average educational level, marital status, and employment status. Pearson correlations were conducted to examine relationships between all variables used in subsequent regression equations. When differences between metropolitan and rural residents were examined, data was analyzed dichotomously utilizing Brazos County as the indicator of urban residence. Metropolitan residents were coded as 1 and rural residents were coded as 0 for analysis. This county was compared with the other seven surrounding rural counties.

Multiple regression can test presumed relationships between predictor and criterion variables. This technique has the ability to separate the effects of independent variables on the dependent variable so that each variable's unique contribution is able to be examined (Allison, 1999). Multiple regression analysis is useful in analyzing data when there are several potential explanations for the relationship among multiple explanatory factors. This data analysis generally uses one dependent variable and several independent variables to test competing explanations. With this method, a regression line is used to relate the average of one variable to the values of the multiple independent

variables. Consequently, regression analysis can be used to predict the values of variables as they relate to the values of other variables.

Hierarchical regression was used in order to observe the effect of the independent variables in a sequential manner, such that the relative importance of an independent variable may be judged on the basis of how much it adds to the prediction of the outcome variable, over and above that which can be accounted for by other important predictors. Independent variables were entered in separate blocks to predict depression total scores. In the first block, gender, income, and age were entered. Males were coded with 0 and females 1s. In the second block, race was added to the previous variables. Here, the same coding for the gender variable was used. For this block, dummy coding was used and two dummy variables, one for Hispanic (1= yes, 0 = no) and one for Black (1 = yes and 0 = no) were utilized; the reference variable coding for White was 0. Zero indicated that Whites did not belong to either the Hispanic or Black categories.

In the third block, the primary predictors of interest were added. These included food stamp participation, WIC participation, household food insecurity, and adult food insecurity. Food stamp participation was coded 1 for Yes and 0 for No. WIC participation was recoded such that any time a person indicated they received benefits one or more months during the 2009 year this demonstrated a positive endorsement of receiving benefits. Yes was coded with 1 and No was coded with 0. Responses for household food insecurity questions that were endorsed positively were coded with 1 and responses that were No were coded with 0. Responses for adult food insecurity questions that were endorsed positively were coded with 1 and No responses were coded

with 0. This order of variables was entered to understand each variable's unique contribution in the prediction of depression.

IV. RESULTS

The purpose of the study was to investigate food insecurity and the use of supplemental nutrition assistance programs as related to depression. Hierarchical multiple regression was the primary statistical procedure employed with household food insecurity and the supplemental nutrition assistance programs designated as the predictor variables and depression the criterion variable with age, gender, race, and income included as control variables. In addition to regression, a post hoc ANOVA was conducted which examined the differences on the variables of food insecurity and use of assistance programs between those categorized as depressed and those categorized as not depressed. This chapter describes how the data were prepared for analysis, the demographics of the sample, and the statistical analyses. The specific research questions that guided the study are provided in conjunction with the analysis section.

Data Screening and Scoring

The complete dataset contained information from 3,964 participants who answered over 400 survey items. The objective of the item screening procedure and scoring process was to create a data file that had complete data for each respondent on each of the variables of primary interest. The items represented the variables of depression, food stamp participation, WIC participation, household food insecurity (HFI), and adult food insecurity (AFI) age, gender, race, and income.

Two hundred eighty (7.1%) of the 3,964 participants did not answer any of the nine depression items and were deleted, leaving an overall N of 3,684. Sixty-one participants (1.5%) did not give a response for one or two of the nine depression items.

These missing responses were replaced with the mean of the particular item of those who did respond to that item (Allison, 2002). Sixty-three participants (1.6 %) did not answer one or more of the HFI, AFI, or food stamp participation items and were deleted leaving an overall N of 3,621. On the demographics, 68 respondents (1.7%) did not answer the race item and were deleted as were 8 (.2%) respondents who reported ages less than 18. This screening process resulted in a final file consisting of 3,545 participants (89.4%) with complete data for each respondent on depression, HFI, AFI, food stamp participation, and demographics.[1]

The next step in the screening process was to obtain scores for depression, HFI, and AFI. The depression score was based on summing the nine depression items which resulted in a depression score that could range from 0 to 27. This score was used in the regression analysis. For the ANOVA analysis the participants were placed in one of two categories (Kroenke et al., 2001) where those with a total score of 0-9 were placed into a *no depression* category and those who scored 10-27 were placed into the *depressed* category.

The HFI and AFI scores were obtained by summing the responses to the HFI and AFI item responses. On the survey, the HFI and AFI food security items were coded as follows: 0 = Often true, 1 = Sometimes true, 2 = Never true, and 3 = Don't know. Thus, when the item responses were summed, a 'Don't know' response was given the most weight and a lower total score indicated greater insecurity. Given that the scoring

[1] Analyses were also run without removing participants with missing data or outliers and no differences were found. It was thus decided to use the dataset that took into account missing responses and outliers in order to keep the N consistent among all the analyses conducted.

method seemed somewhat counterintuitive, it was decided that it would be more meaningful and more easily understood if a higher score indicated greater insecurity similar to a higher depression score indicating greater depression. This designation was accomplished prior to summation by reverse coding the responses where 0 = Don't know, 1 = Never true, 2 = Sometimes true, and 3 = Often true. As part of the scoring procedure, the reliability (Cronbach's alpha) was obtained for each of the scales; depression scale (α = .89), HFI (α = .87) and AFI (α = .65). The depression and HFI scales considerably exceeded the criterion of .70 often used as the criterion for reliability (Nunnally, 1978). While the AFI reliability was less, it was considered near enough to the criterion and was retained in the analysis.

The data were then screened for outliers on the depression measure that could influence the statistical results. This was achieved by converting the depression raw scores to z-scores for each participant based on a mean of 0 and a standard deviation of 1. A z-score greater than 3.29+/- standard deviations from the mean was considered as extreme and removed from the analysis (Levine & Stephan, 2010). This reduced the overall N to 3,401. The depression score distribution is discussed further in the data analysis section below where the assumptions underlying the statistics employed are described. The HFI and AFI scores were not screened for outliers since they were based

on only two and three items respectively.

After these initial screening procedures, the overall dataset of 3,401 contained both rural (N = 2499) and metropolitan (N = 902) respondents. The purpose of this study addressed how household food insecurity relates to depression and what effects this may have in participation in nutrition assistance programs in rural communities. As such, the results presented in the following sections are based on rural respondents.

Demographics

Table 2 describes the respondents on a number of demographics of interest. Participants' mean age was approximately 58 with the annual income of just over $57,000. The standard deviation on income (*SD* = $40,137.26) indicated a large variation in incomes among the participants. The majority were female and White. Over 50% indicated education greater than high school, which suggests that the sample may have had more education than the general population. Most of the participants were married and employment was about equally split.

Table 2

Demographic Characteristics of the Rural Participants (N = 2499)

Characteristic	*n*	%	*M*	*SD*
Age			58.14	14.32
Income			$57236.56	$40137.26
Gender				
Female	1772	71		
Male	727	29		
Ethnicity				
Blacks	173	7		
Hispanics	158	6		
Whites	2168	87		
Education				
Less than high school	99	4		
High school	940	38		
More than high school	1425	57		
Did not respond	35	1		
Marital status				
Married	1707	68		
Widowed	334	13		
Divorced/separated	284	11		
Single/never married	100	4		
Living with partner	57	2		
Did not respond	17	1		
Employment				
Yes	1177	47		
No	1287	52		
Did not respond	35	1		

Data Analysis

The three research questions that guided the study are repeated. As stated previously, the analysis was based on the rural participants.

1. What is the correlation between food insecurity and depression in a large sample of individuals living in rural counties?
2. What is the correlation between participation in a supplemental nutrition assistance program and depression in a large sample of individuals living in rural counties?
3. Does food insecurity contribute significantly to the prediction of depression independent of other relevant factors such as gender, age, race, and income?

Descriptive statistics, bivariate correlation, and multiple regression were used to analyze the data. Multiple regression tests presumed relationships between several predictor variables and a criterion variable. This technique is used to separate the effects of predictor variables on the criterion variable so that each predictor variable's unique contribution can be examined (Allison, 1999). More specifically, hierarchical multiple regression was used. In this procedure the predictor variables are entered in steps in a sequential manner. The criterion variable was the depression total score as measured by the nine items in the survey. The predictor variables of primary interest were food stamp participation, WIC participation, and the two food insecurity scores of HFI and AFI. These are reflected in the first two research questions above.

The third research question lists several demographic variables that were taken into account as covariates or control variables. These variables were age, gender, race, and income and considered as possible predictors of depression beyond the primary predictors. In hierarchical regression the control variables are entered in the initial steps. The primary predictors are then entered as the last step. In this way it can be determined

if the primary predictors add to the prediction of the criterion variable beyond that which can be accounted for by the control variables (Allison, 1999).

Regression assumes that both the predictors and the criterion variables are continuous. For these data, several of the predictors were categorical. They were gender (male/female), race (Hispanic/Black/White), food stamp participation (Yes/No), and WIC participation (Yes/No). For regression purposes categorical variables can be coded 1 or 0 in order to meet the assumption of continuity. This procedure is referred to as "dummy coding" (Cohen, Cohen, West, & Aiken, 2003). Gender was coded as 1 = female, 0 = male; food stamp participation 1 = yes, 0 = no; and WIC participation 1 = yes, 0 = no. Where there are more than two categories, as with race, one of the categories is left out of the coding and becomes a reference category against which the effects of the other categories are assessed. The choice of the reference category is subjective although typically it is the most common or largest category (Cohen, et al., 2003). For these data Whites was the largest category and was therefore considered the reference category. Two dummy variables were then created, one for Hispanic (1 = yes, 0 = no) and one for Black (1 = yes and 0= no). The reference variable coding for White was 0. Zero indicated that Whites did not belong to either the Hispanic or Black categories.

The next procedure assessed the assumptions underlying regression. These assumptions deal primarily with normality, linearity, and homoscedasticity. The assumption of normality is the expectation that the data are normally distributed. Descriptive analyses of the raw scores for depression, HFI, and AFI distributions showed positive skew (skew = 39.39, skew = 39.32, skew = 37.31 respectively)

indicating that the scores tended to be distributed toward the low end of the normal curve. This was not surprising in that the majority of participants drawn from the general population would not be expected to show depression or to participate in food stamp and WIC programs. Thus, there were many zero or near zero raw scores relative to high scores on the three measures causing the positive slope.

One procedure used to change a positively skewed distribution into a more normal distribution is to transform the raw scores using a log transformation (Weinberg & Abramowitz, 2008). This procedure was completed on the three scores for each participant. This process decreased the skewness substantially. Other transformation procedures were also tried but none had greater success than the log transformation. Thus, the scores used for depression, HFI, and AFI in the correlation and regression analyses were the log scores.

The three assumptions of normality, linearity, and homoscedasticity were then evaluated simultaneously through the analysis of a standardized residuals scatterplot (Tabachnick & Fidell, 1989). Observation showed that the plots were scattered evenly above and below the standardized prediction values and the plot was rectangular which demonstrated that the assumptions of normality, linearity, and homoscedasticity were met.

Initial Analyses

Table 3 shows the bivariate correlations for all of the variables used in the regression analysis. The .05 level of probability was used as the basis for determining statistical significance. Statistical significance depends greatly on sample size. When the

sample is large, as in this study, even correlations near zero are statistically significant. Thus, while a correlation may be statistically significant it may be of little importance. Effect size can be used to interpret the importance of a statistic regardless of statistical significance and is recommended by the American Psychological Association to be included in conjunction with any statistical results (APA, 2009). It is common to refer to an effect size as small, medium, or large. For correlation, an often used standard for evaluating correlation coefficients as effect sizes, is .10 representing a small effect size, .30 for a medium effect size, and .50 representing a large effect size (Cohen, 1992).

Observations of the correlations in Table 3 indicated that the majority of correlations can be considered small in importance even though most of them are statistically significant. Several of the correlations could be considered medium in respect to effect size and they are in bold type. The first row of the table shows the correlations between depression and the variables used in the subsequent multiple regression. The most important of these correlations being those between depression and the two food insecurity variables, HFI (r = .36) and AFI (r = .33) which could be considered being of medium importance as predictors. The remaining correlations in the first row, while small, were also of interest. The positive correlation between depression and gender (r = .11) indicated that females were more likely to demonstrate symptoms of depression than males although the relationship was not a large one. The negative correlation between depression and income (r = -.17) indicated that the greater the income participants reported, the fewer symptoms of depression they endorsed. This was also the case with the relationship with age (r = -.09). The relationship between Hispanic

and depression was near zero (r = .02) while that of Blacks was higher (r = .08) but still could be considered small in respect to importance. The food stamp and WIC correlations with depression (r = .06 and r = .08) also suggested that participation in these programs was relatively unimportant since the correlations were near zero. The positive correlation between HFI and gender (r = .13) and AFI and gender (r = .10) indicated that females were more likely to demonstrate symptoms of food insecurity than males although the relationship was also not a large one.

Additional correlations that were noteworthy were ones between household and adult food insecurity and food stamp participation. The associations between household food insecurity and food stamp participation (r =.02), adult food insecurity and food stamp use (r =.00), WIC participation and household food insecurity (r = .04), and WIC participation and adult food insecurity (r = .05) were small and relatively unimportant. Other correlations in the table showed patterns of intuitive logic to a degree. The correlation was positive between the two participation measures (r = .30) indicating the tendency for those who used food stamps to also participate in WIC. Income showed a negative correlation with both food insecurity measures (r = -.31 and - .26) meaning that the greater the income the less food insecurity. The large positive correlation between the two food insecurity measures (r =.69) showed that those who experienced household food insecurity also experienced adult food insecurity.

Table 3

Intercorrelations for Depression and Predictor Variables (N = 2499)

Variable	1	2	3	4	5	6	7	8	9
Criterion									
Depression	.11*	-.17*	-.09*	.02	.08*	.06*	.08*	**.36***	**.33***
Predictor variable									
1. Gender	__	-.06*	-.13*	.04*	.03	.02	-.03	.13*	.10*
2. Income		__	-.25*	-.13*	-.15*	.03	-.02	**-.31***	**-.26***
3. Age			__	-.19*	-.01	-.03	-.03	-.16*	-.15*
4. Hispanic				__	-.07*	.00	.02	.16*	.10*
5. Black					__	.03	.06*	.18*	.12*
6. Food stamp						__	**.30**	.02	.00
7. WIC							__	.04*	.05*
8. HFI								__	**.69***
9. AFI									__

*$p < .05$

Regression Analyses

As described earlier, hierarchical multiple regression was used to determine to what extent the combined predictor variables predicted the criterion of depression. The data were entered in three steps (blocks of data). The first two steps included the predictor demographic variables used as the control variables. Step 1 included gender, income, and age. Step 2 added race to the step 1 variables and step 3 added the primary predictors of interest (food stamp, WIC participation, household food insecurity, and adult food insecurity). The results of the regression analysis are shown in Table 3. The .05 level was used as the basis for determining statistical significance.

Whereas the correlations in the first row in Table 3 are the bivariate correlations (*r* values) between depression and each individual predictor, the *R* values in Table 4 show the multiple correlation (*R*) with depression when the predictors are combined. Thus, gender, income, and age in combination in Step 1 correlated .228 with depression. When Hispanic and Black were added in Step 2 the correlation increased slightly from .228 to .234. The last step added the four variables associated with food program participation and food insecurity. The entry of the Step 3 variables substantially increased the multiple correlation *R* from .234 to .396.

While the *R* coefficients are useful, the most informative values are R^2 and ΔR^2. R^2 is the *R* value squared and indicated the proportion of variance shared between the criterion and predictor variables. An R^2 value of 0 would indicate no shared variance while an R^2 value of 1.00 would indicate 100% shared variance meaning that the criterion could be perfectly predicted from the predictors. It can be seen in the table that the shared variance increased from about 5% in Steps 1 and 2 to about 16% in Step 3. ΔR^2 indicated the change in R^2 from step to step. The change from Step 1 to Step 2 (ΔR^2 = .003) was quite small but statistically significant due to the large N. However, the change from Step 2 to Step 3 ($\Delta R2$ = .102) was substantial.

Similar to effect size interpretation of bivariate correlations, the R^2 in multiple correlation can also be interpreted as an effect size where .02, .15, and .35 suggest small, medium, and large effects respectively (Cohen, 1992). From this perspective the R^2 values in Steps 1 and 2 could be considered small in importance. The R^2 for Step 3 could be considered as being of medium importance (R^2 = .157). In respect to the three

research questions, these results tend to support the hypothesis that participation in food programs and food insecurity are positively associated with depression (Q1 and Q2) when controlling for demographic variables (Q3). However, the relationship is only of medium strength and not strong.

The three overall *R* values are ways to consider the correlations when the predictors are combined. The standardized beta weights (β) can be used to examine the individual predictor's contribution to the overall *R* value. Each β weight is based on a mean of 0 and standard deviation of 1 and can thus can be compared directly (Nathans, Oswald, & Nimon, 2012). The large N resulted in almost all of the weights being statistically significant including those that made little or near zero contribution. The final step (Step 3) is of most interest. Household food insecurity made the largest contribution to predicting depression (HFI β = .234) with Adult food insecurity (AFI β = .136) being the second largest contributor. The step accounted for an additional 10% of the variance in depression, above and beyond that attributable to the previous steps. Because the beta weights can be compared directly, HFI contributed almost twice that of AFI (.234/.136 = 1.72). Participation in the WIC program was also a significant contributor at this step.

Table 4

Hierarchical Regression Analysis Predicting Depression with Predictor Variables (N = 2499)

Step and predictor variable	R	R^2	ΔR^2	t	β
Step 1	.228*	.052*	.052		
Gender				4.30	.085*
Income				-9.49	-.192*
Age				-5.98	-.122*
Step 2	.234*	.055*	.003*		
Hispanic				-.95	-.109
Black				2.40	.048*
Step 3	.396*	.157*	.102*		
Food stamp participation				1.73	.033
WIC assistance				2.93	.057*
HFI				8.78	.234*
AFI				5.31	.136*

*$p < .05$

Post Hoc Analyses

Two post hoc analyses were conducted. One was done to confirm and support the multiple regression analysis and the other was an omnibus exploratory analysis to examine a possible difference in depression between rural and metropolitan participants controlling for the food security and demographic variables.

An analysis of covariance (ANCOVA) was used to follow up the results of the hierarchical regression analysis. ANCOVA can be used to determine whether groups differ while controlling for the effects of covariates similar to regression. The regression analysis (Table 4) showed that three of the four food insecurity predictors correlated

with depression. That is, higher depression was significantly associated with greater food insecurity. One food insecurity predictor, food stamp participation, had no statistically significant relationship with depression.

For the ANCOVA the participants were placed into two groups in which those with a total score of 0-9 were placed into a not depressed group (N = 2208) and those who scored 10-27 were placed into the depressed (N = 291) group (Kroenke et al., 2001). Four ANCOVAs were then performed, one for each food security measure, to determine if there were differences between the two groups. Table 5 provides the results of these analyses. The .05 level was used as the criterion for statistical significance. As may be seen, each of the *F* ratios was statistically significant ($p < .05$) indicating that the groups differed on each of the food security measures.

Observation of the means show that the depressed group was higher on each of the three measures shown to be statistically significant in the regression analysis as well as on the food stamp participation measure.

Table 5

Means, Standard Deviations for Depression and ANCOVA Results for Differences between Four Food Insecurity Measures

Measure	Depressed (N = 291) *M*	*SD*	Not depressed (N = 2208) *M*	*SD*	difference	*F*(1, 2492)
Food stamp participation raw scores	.15	.36	.08	.27	.07	15.98*
WIC assistance raw scores	.08	.27	.03	.16	.05	5.60*
HFI raw scores	3.57	1.56	2.40	.94	1.17	244.91*
AFI raw scores	4.23	1.44	3.24	.73	.99	266.36*

$p < .05$

For the second post hoc analysis the participants were categorized into rural (N = 2499) and metropolitan (N = 902) groups. Interest was in whether the two groups differed on depression when controlling for the demographics as well as the food security measures The raw score means and standard deviations were $M = 3.89$, $SD = 4.62$ and $M = 3.82$, $SD = 4.68$ for the Metropolitan and Rural groups respectively . The analysis was done on the raw score transformed scores due to non-normality (Table 6). No difference was found $F(1, 3391, p > .05)$. Observation of the means based on the transformed scores on depression for the two groups showed that they were virtually the same in respect to depression, as were the raw score means.

Table 6

Means, Standard Deviations for Depression and ANCOVA Results for Differences between Metropolitan and Rural Groups

Measure	Metropolitan (N = 902) *M*	*SD*	Rural (N = *M*	*SD*	difference	*F*(1, 3391)
Depression	.52	.39	.51	.40	.01	.28

Summary

The purpose of the study was to determine the relationship of a number of variables hypothesized to be related to depression based on a sample of 2,499 respondents from rural counties in Brazos Valley, Texas. Four of the variables were measures of food program participation and food insecurity. Five variables were demographics thought to also be related to depression. Hierarchical regression was employed to determine the extent of the relationships. This chapter describes the preparation of the data for analysis in respect to dealing with missing responses, scoring of the measures, the identification of outliers, and screening of the assumptions underlying regression. The sample demographics are provided in addition to the descriptive statistics and intercorrelations among the variables. The results of the hierarchical regression showed, after controlling for the demographic variables, that food insecurity accounted for the most variance shared with depression although the relationship was not strong.

Post hoc tests followed the primary regression analysis. The participants were placed into either a depressed or a not-depressed group. Four ANCOVAs were conducted, one on each of the four food insecurity measures, to determine if there were differences between the depressed and not depressed groups. All four were statistically significant and supported the regression findings showing that individuals who met the PHQ-9 criteria for a depressive disorder reported greater food insecurity than respondents who were not depressed. Although not a formal research question, a second post hoc analysis examined if rural and metropolitan participants differed on depression. No difference was found. The results are discussed in the next chapter and recommendations for continued research are made.

V. DISCUSSION AND CONCLUSIONS

The aim of the present study was to investigate the relationship between food insecurity, measured by adult and household food insecurity and depression, as measured by the PHQ-9 and what effects supplemental nutrition assistance program participation may have along with other variables. Specifically, the study examined if food insecurity contributed significantly to the prediction of depression independent of other relevant factors such as supplemental nutrition assistance participation, age, gender, race, and income in rural communities. Findings for a sample of 2,499 individuals indicated that household food insecurity made the largest contribution to predicting depression, as measured by the PHQ-9, although the relationship was not strong. Findings also indicated that adult food insecurity made the second largest contribution to predicting depression. Correlational analysis revealed that the majority of correlations can be considered small in relevance although most were statistically significant.

Both household food insecurity and adult food insecurity were significantly predictive of depression; however, there was a minimal relationship between supplemental nutrition assistance program participation and depression as measured by the PHQ-9. Correlational analysis revealed significant positive associations between both types of food insecurity and depression. The relationship between food stamp participation and depression and WIC participation and depression was relatively unimportant given the correlations were near zero. Gender was significantly associated with higher endorsement of depression symptoms, with women more likely to report

symptoms than men. This relationship has been well documented in the literature (Blazer, Kessler, McGonagle, & Swartz, 1994; Bogner & Gallo, 2004; Brossart et al., 2013; Kessler et al., 2005). Correlations also indicated that the greater the income participants reported, the fewer symptoms of depression they endorsed and the higher in age the participants were, the fewer symptoms of depression they endorsed. Findings also indicated that individuals who reported greater income reported less adult and household food insecurity. There was a limited positive relationship between being Hispanic and endorsing depression symptoms although there was a greater relationship between being Black and endorsing such symptoms. Intuitively, correlations substantiated that those who experienced household food insecurity were also found to experience adult food insecurity and those who participated in the WIC program also utilized food stamps.

The current study proposed food insecurity, as indicated by adult and household food insecurity, as a significant predictor of depression independent of relevant factors such as age, gender, race, income, and supplemental nutrition assistance participation. The results supported the assertion that higher food insecurity was a significant predictor of depression as indicated by a higher PHQ-9 score. Post hoc analysis further supported the statement that individuals who were depressed, as measured by the PHQ-9, reported greater levels of food insecurity compared to individuals who did not meet criteria. Literature has suggested a significant relationship between food insecurity and depression (Zekeri, 2010), however the evidence regarding the direction of the relationship has been variable. Several studies have been conducted to see if food

insecurity predicts depression or if depression predicts food insecurity. Whitaker, Phillips, and Orzol (2006) found that when mothers are coping with food insecurity, both they along with their children experience higher levels of depression and anxiety. Garg, Toy, Tripodis, Cook, and Cordella (2014) found that the risk for household food insecurity in low-income families with young children is increased when the mother is depressed. Huddleston-Casas, Charnigo, and Simmons (2009) found that the association between household food insecurity and depression is bidirectional. The present study revealed a significant association between gender and increased food insecurity with women being at greater risk. However, increased food insecurity was significantly predictive of depression for the entire sample. Concerning differences within this sample in reporting rates of depression between individuals identifying that they lived in rural areas versus living in metropolitan areas, it was found that there was no significant difference when controlling for the demographics as well as the food insecurity measures.

Although food insecurity was found to be a significant predictor of depression, it was also found that WIC assistance participation also played a significant role on depression. It is important to note that the variables HFI, and AFI, and WIC assistance demonstrated shared variance that was predictive of depression and even though food stamp participation was assessed in the same step in the regression analysis, it showed predictive value of minimal significance. Food stamp participation may not have been predictive of depression because it includes male participants whereas WIC participation

is only available to mothers and their children. As mentioned previously, women were more prone to endorsing symptoms of depression.

Food insecurity, as reflected in the HFI and AFI variables, was predictive of depression. Individuals participating in the WIC assistance program endorsed higher levels of depression. Due to the dearth of literature focused on assessing the relationship between WIC participation and depression, only one other study reports a similar finding. Pooler, Perry, and Ghandour (2013) conducted a study to determine the incidence and associations between postpartum depressive symptoms (PDS) among women who had recently had a baby and specifically those who were participating in and eligible for WIC. This study used data from the PRAMS, the Pregnancy Risk Assessment Monitoring System, produced by the Centers for Disease Control and Prevention (CDC) and the health departments within each state. For the PRAMS, data are collected annually by individual states and reported to CDC. Pooler et al. (2013) utilized data spanning from 2006-2008 and 22 different states. Their final sample size was 75,234 women who had recently had live births, were participating in WIC or were WIC-eligible, and whose children were living with them at the time of the study. Findings showed that 19.8% of WIC participants demonstrated symptoms of PDS compared to 16.3% of non-participants who were WIC-eligible, and 6.8% of women not eligible for the program. This information exemplifies that WIC participants are at a significantly higher risk for PDS than their WIC-eligible, non-participating counterparts. Pooler et al. (2013) also found that WIC participants had a higher prevalence of multiple risk factors compared to those who were eligible but not enrolled. Results confirmed

previous findings regarding multiple risk factors and PDS. WIC participants, who are also experiencing multiple risk factors, intuitively would be more prone to postpartum depression.

Age, income, and race also played a significant role on depression in the present study. In this sample, age was predictive of depression. Younger residents indicated higher levels of depression in comparison to older peers. Increased rates of depression among younger populations have been well documented in the literature (Blazer et al., 1994; Comstock & Helsing, 1976; Gonzalez, Tarraf, Whitfield, & Vega, 2010; Probst et al., 2006). Younger residents may experience pressures to perform socially or financially provide for themselves, their children, and their parents. Younger residents in an underserved area may not have as many significant employment and training opportunities due to the nature and location of their residence.

Income was also found to be a significant predictor of depression. Individuals who reported having lower levels of income also reported higher scores on the PHQ-9. Individuals with lower socioeconomic status have a higher likelihood of being depressed and the odds of having persistent depression is higher than a depressive episode (Lorant et al., 2003). Lorant and collegues (2003) conducted a meta-analysis supporting the assertion that low-SES increases the risk of depression over the assertion that depression hinders social movement, although both processes co-occur. Poverty-related stress directly predicts internalizing symptoms such as anxiety and depression across age groups, while poverty-related stress exacerbates externalizing behaviors such as delinquency and attention problems (Santiago, Wadsworth, & Stump, 2011). Low-

income women also experience higher rates of postpartum depression. Postpartum is as high as 30% for low-income women, compared to 15% for high-income women (Hobfoll, Ritter, Lavin, Hulsizer, & Cameron, 1995). Individuals with lower incomes may face additional stressors associated with poverty that may make them more susceptible to depression.

Individuals who live in rural or low-income areas may have limited resources or opportunities for social mobility or financial improvement. In the current study, almost half of the participants indicated they were currently unemployed at the time of the survey, which may have also significantly contributed to the prediction of depression.

Race was also found to be a significant predictor of depression: Specifically, Black individuals in the study endorsed symptoms of depression at higher levels than their Hispanic or White counterparts. African Americans living in rural communities have traditionally faced numerous hardships and disparities above and beyond any solely tied to rural residency (Jensen, 1991). There is currently insufficient research regarding this rigorous experience of African Americans in rural communities and the literature that does exist about rural populations does not focus solely on the African American experience. This limited literature also tends to focus on specific health concerns within the community. Pathman, Fowler-Brown, and Corbie-Smith (2006) found that Blacks reported more unmet needs, obstacles to receiving care, and dissatisfaction with received care than their White counterparts in the rural South although they had similar rates of use of outpatient medical care. In addition, there have been several studies focusing on the various health problems prevalent within the Black community (Brancati, Kao,

Folsom, Watson, & Szklo, 2000; Dressler, 2003; Marshall, Jr., 2005). There are also contradictory findings regarding the incidence of depression by race/ethnicity in the United States (Riolo, Nhuyen, Greden, & King, 2005). Findings regarding the incidence of major depressive disorder and dysthymic disorder indicated that African Americans and Mexican Americans endorsed significantly lower rates of major depressive disorder than their White peers (Riolo et al., 2005) Dysthymia, however was found to be higher in African Americans and Mexican Americans than in their White peers. Furthermore, racial and ethnic minority women, Black and Asian women are shown to have greater prevalence of depression during pregnancy compared to White women (Gavin et al., 2011). Based on all of these findings, issues facing African Americans living in rural areas need further exploration.

Additional findings from the present study worth noting are that gender and food stamp participation were also found to be significantly correlated with food insecurity. In the current study, females were more likely to endorse both adult food insecurity and household food insecurity. The literature supporting these phenomena is limited; however, some studies have noted the unique characteristics that may explain why women would be more likely to be food insecure (Olson, 2005; Quisumbing, Brown, Feldstein, Haddad, & Pena, 1995). Women have almost exclusively become in charge of the nutrition security in the home through both food and other resources (Quisumbing et al., 1995). They may find themselves in the role of "gatekeepers" making sure that everyone in the household, especially their offspring or youngest in the household, receive an adequate portion of food. This may be due to societal and cultural norms

(Quisumbing et al., 1995). This may contribute significantly to their increased reports of food insecurity.

In this study, supplemental nutrition assistance participation was not found to have a significant correlation with food insecurity. Investigation into the relationship between food insecurity and supplemental nutrition assistance has revealed that food insecurity, with regard to these programs, may be related to the time an individual begins to participate and how long they participate in a program. Wilde and Nord (2005) found that food insecurity was associated with transitioning in and out of the food stamp program. As noted earlier, Nord (2011) further confirmed that food insecurity was associated with whether or not supplemental nutrition participants continued on the SNAP program throughout the survey year. This phenomenon may help explain the limited relationship between food insecurity and supplemental nutrition assistance in the current study.

There are a few possible explanations for these outcomes. First, in this study, both household and adult food insecurity were shown to be predictors of depression, and the literature has shown that this relationship can be bidirectional. This relationship may exist for several reasons. Individuals who are depressed or demonstrate symptoms of depression may have a loss of energy or increased fatigue, have psychomotor retardation (e.g. slowing down in movements or freedom to move), have a preoccupation with worry or irrational fears, may be more indecisive, and may have a diminished ability to think or concentrate. When individuals experience food insecurity, worries about where their next meal is going to come from or if they will have enough money to buy food or

what food to buy may exacerbate underlying symptoms of depression for which that the individual may already have a propensity. Individuals who feel food insecure may feel like they do not have the ability to control certain aspects in their quality of life which can lead to depression. On the other hand, when individuals are depressed and they are unmotivated to seek assistance or to follow through with receiving the assistance they have received due to some of the symptoms such as increased fatigue or indecisiveness, this may also lead to food insecurity. The bidirectional nature of this relationship suggests interventions and further research that address both depression and food insecurity are warranted.

Other major findings worthy of discussion were the relationships between gender and symptoms of depression and food insecurity. Women have historically been shown to demonstrate symptoms of depression at higher rates than males (Blazer et al., 1994; Bogner & Gallo, 2004; Kessler et al., 2005). Gender roles may contribute significantly to this inequality in depressive symptoms. Higher symptom rates in this study and over time may be symptomatic of depression measures being primarily self-report in nature. However, higher depressive symptoms rates among females could also be due to males possibly underreporting symptoms due to social norms or stigma associated with mental health or their perceived understanding or expression of masculinity. Further investigation is warranted on men's perceptions regarding depression and self-identifying as depressed.

Women's roles also likely play a role in the food insecurity outcomes of this study. Women have to manage multiple roles as well as resources and responsibilities in

the home differently than those of their male counterparts (Olson, 2005). These roles include safeguarding that the family has consistent and balanced meals, helping to avoid family conflicts over food, and creating nutrition goals and patterns for the family. Therefore, for many households, handling food insecurity is the woman's responsibility (Olson, 2005). A woman's ability to manage the resources for her home is more relevant for the children and other vulnerable individuals living in the household (Quisumbing et. al, 1995). This may increase a woman's stress, anxiety, potential for depression, and may also impact her perceptions of her own self-worth and self-efficacy.

Women may look for alternative options for feeding the members of the home to maximize their time and finances. These alternatives may include processed foods or more cost-effective options. They may utilize this time to participate in the labor market which can help generate income. Generating income can, in turn, take time away from their child rearing and away from maintaining their own appropriate nutrition habits (Brown, Yohannes, & Webb, 1994). A change in parenting habits may impact her own perceptions of her abilities as a mother or her community's perceptions of her as a parent. This in turn, can potentially play a role in anxiety or depression manifestation.

Women also have the tendency to neglect their own nutritional well-being for the sake of those in the home during times when resources are not as readily accessible (Olson, 2005; Radimer, Olson, & Campbell, 1990). During more difficult times, because women are in charge of managing family feeding, they may lower the quantity and quality of their own food intake to feed children when the family is threatened by food insecurity. Women may reduce their consumption of healthier foods which also places

them at increased risk for obesity (Olson, 2005). If women choose to put their children's nutrition first, it is usually at the expense of personal nutritional needs. Because women sacrifice their own needs over those in the home, it is not surprising that many of these women inevitably demonstrate symptoms of depression (Olson, 2005).

The next association worth discussing was the relationship between African Americans and slightly higher rates of depression. The experience of minorities living in rural areas has been shown to be riddled with adversities that could contribute to symptoms of depression (Jensen, 1991; Probst et al., 2004). As noted earlier, individuals living in rural areas face health and mental health disparities that those who live in urban areas do not. Minorities are often more vulnerable to these conditions as well. Rural residents typically are less likely to be insured, make a lower wage, and often lack access to health and mental health care. In 2001, the Surgeon General's Report on Mental Health, Culture, Race, and Ethnicity (US Department of Health and Human Services, 2001) declared disparities in utilizing services, access, and outcomes among African Americans/Blacks as a public health concern. Watkins, Green, Rivers, and Rowell (2006) found that there were 10 risk factors for depression and depressive symptoms for African American males outlined in the literature. These included age, conflict between the genders, employment status, economic status, family structure, health, psychosocial coping, racism/discrimination, residential status, and violence. Other research has shown that African American women may become depressed in response to their stressful psychosocial environments (Barbee 1992; Brown, Brody, & Stoneman, 2000). Furthermore, studies have shown that the effects of discrimination on stigmatized groups

including discrimination experienced among African Americans was associated with both mental and physical health symptoms (Fernando, 1984; Jackson et al., 1996; Kessler, Mickelson, & Williams, 1999; Williams, Yu, Jackson, & Anderson, 1997; Williams & Williams-Morris, 2000). Broman, Mavaddat, and Hsu (2000) further discovered that younger African Americans had a tendency to perceive more discrimination than their older counterparts. Additionally, African American males experienced more job discrimination and discrimination from police and those who perceived discrimination demonstrated less autonomy and increased psychological distress.

The present study also discovered that there was no difference within this sample in reporting rates of depression between individuals living in rural areas versus those living in metropolitan areas when controlling for the demographics as well as the food insecurity measures. This suggests that effects of depression were pronounced among certain individuals independent of rural status. The difference among groups may have been due to particular protective factors for some individuals such that these major predictors did not exert the same negative effects.

Limitations

Several limitations were encountered during the formation of this study. First, the current study made use of a secondary data set, meaning that the data was not initially collected with these specific research questions in mind nor designed to take into account the specific purpose of this study. Furthermore, this also means that specific data collection techniques, data analysis methods, and specific data protocols employed in

this study were not considered prior to collecting the data. Despite these limitations, using a secondary dataset allowed for a multi-disciplinary perspective into public health and psychology research, provided access to a diverse sample, and made data accessible that required considerable resources and time to collect.

An additional limitation was that there may have been an underestimation in the number of households experiencing food insecurity since sampling was based on telephone calls. Because having a land-line is potentially associated with financial means and individual's level of income is related to their level of food insecurity, some participants may have inadvertently been eliminated. This sampling method may have led to a decreased ability to generalize outcomes.

Another important limitation to this study was the size of the sample and the difference in size of groups being compared such as metropolitan residents versus rural residents. The initial dataset contained information for 3,964 participants. However, due to missing data, the sample was decreased to 3,401 respondents, including 2,499 from rural areas and 902 from a metropolitan area. Because statistical significance depends greatly on sample size and in this study the N was very large, results may have been skewed because of the sample size. Although the sample was large, however, a relatively small percentage of residents in each county actually responded to the survey, thus providing for smaller sample sizes within the larger group. This observation may allow for the interpretation that the analysis was in fact not as skewed by the larger sample size as hypothesized above. This may be particularly relevant given the uniqueness of cross-sectional data. Due to missing data and particular participants' removal from the sample,

selection bias may have occurred. A more robust discussion regarding the potential influence of missing data was generally absent in this study.

Another relevant limitation to note was the use of modified measures for capturing information regarding household and adult food insecurity. Traditionally, the Radimer-Cornell hunger and food insecurity scale has 13 questions to assess for household, adult, and child food insecurity; however, for the purposes of the original data collection, only select questions were utilized. Additionally, the use of single-item variables to assess WIC and supplemental nutrition assistance participation also served as a limitation in data analysis. Broader measures would have provided more exhaustive data and increased the reliability and validity of these variables. This could also have improved our knowledge about the specific associations between food insecurity, supplemental nutrition assistance, and depression.

Another limitation was the strict reliance on self-report measures. The reliability of determining food security with self-report data has limitations. This information is based on the participant's perception of their own food security. Depressed individuals often have problems with worry, irrational fears, may be indecisive, and have a diminished capacity to think or concentrate. Consequently, responses about food insecurity from depressed individuals may have been skewed. Some populations have also been shown to under-report food insecurity and over-report depression. Elderly individuals may underestimate the occurrence of food insecurity due to a difference in socioeconomic conditions, perceptions, attitudes, and experiences through the course of their life toward food issues (Wolfe, Olson, Kendall, & Frongillo, Jr., 1996). This may

be the case for other marginalized groups as well. Many depressed individuals describe personal symptom indicators that are dissimilar from the clinician ratings of patient's symptomatology (Kim et al., 2013). Research suggests that lower IQ, a less conscientious personality, lower levels of impulse control, and a more anxious personality type were significant predictors of more severe self-reported symptoms of depression compared with clinician-rated symptoms (Kim et al., 2013). Identifying somatic symptoms of depression was less likely than these predictor variables to account for discrepancies of psychological symptoms between self and observer ratings. Although using self-report measures has these stated limitations, it can also be very useful in obtaining insight into an individual's own subjective experience which may be unobtainable any other way. In addition, self-report methods can be utilized to gain information in situations where observational data are not normally available. In this study, because the validity of the measures used to obtain the self-reported data were verified, it can be inferred that self-report data was a valid means for collecting the information desired. In the future, it may be helpful to used mixed methods for collecting information such as participant interviews or more qualitatively based protocols in addition to quantitative measures to gain a more extensive view of the participants.

Recommendations for Future Studies

Future studies are still needed to explore the relationship between food insecurity, depression, and chronic disease within rural populations. Given that rural populations continuously face health and mental health disparities, it is imperative that

research continue to help discern the influence food insecurity may have on the overall well-being of rural residents. It would also be important to further understand women's roles in the home and the impact their mental health, food insecurity, employment, perceived self-efficacy, and ability to manage household resources may play on the household. Finally, future research could focus on the transition periods of participating and not participating in supplemental nutrition assistance programs and what impact these have on food insecurity and depression as well as what role supplemental nutrition assistance plays in reducing disparities. Regarding research design, a mixed methods approach, different than survey methodology, would allow for a different understanding of the phenomenology behind food insecurity and rural populations. Finally, protocols that measured household and adult food insecurity more comprehensively should be considered.

Conclusion

While there is a growing body of literature examining the outcomes of supplemental nutrition assistance participation and its effects on food insecurity and mental health, the relationship between these variables continues to be vague. The current study sought to investigate and understand relevant predictors of self-reported depression in a sample of rural-residing residents. More specifically, the purpose was to understand the role of food insecurity and supplemental nutrition assistance regarding depression. Research investigating the food insecurity experience and mental health of rural residents is limited. This study provided valuable information for necessary future research, particularly the relationships between depression, food insecurity, and

supplemental nutrition assistance in rural populations. This information will aid in the development of programmatic research and intervention programs to address the needs of rural populations. Programmatic research and intervention programs focusing on the psychological components associated with food insecurity and supplemental nutrition assistance participation may be beneficial. Given the unique challenges that rural residents face daily, lack of access to services, inconsistent access to nutritious food, and other health and mental health disparities, especially for women living in rural areas, and the harmful consequences of these issues, future research in this area is needed.

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